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Brief 70-10045

AEC-NASA TECH BRIEF

Commutating Brushes Tested in DC Motors in Dry Argon Atmospheres

The test apparatus and procedures for testing of dc-motor brushes operating in a dry argon atmosphere have been described (see Reference). Operation of dc motors in a dry, low-oxygen atmosphere can cause rapid wear of the commutating brushes. Operation of manipulators, driven by direct current, has presented commutation problems requiring extensive tests of brush materials.

These tests were performed by operation of dc motors, of the type used in the manipulators, in an enclosure containing an atmosphere of high-purity argon; a gas-purification system was used to control the moisture and oxygen contents of the enclosure. Brushes were supplied by three vendors on the basis of their brush-grade recommendations for use in dry atmospheres.

The initial purpose of the tests was to determine as quickly as possible the best grade of brush for such use, since brush failures were seriously hampering operation of the manipulators. As testing progressed, the possibility of determination of minimum concentrations of impurities in argon (primarily moisture, with some emphasis on oxygen), conducive to good brush wear, became apparent.

One grade of brush was tested by variation of the moisture concentration between less than 5 and 100 ppm; the results are summarized in the Reference. Data scatter in the test results is discussed as a function of both oxygen and nitrogen concentrations and other variables pertinent to brush wear on a sliding surface. Specific applications of the most promising brush materials tested are cited, aside from the use for which the tests were originally performed.

The tests resulted in selection of a brush material (Stackpole grade-660) that is being used successfully in manipulator-drive motors. Similar brushes have also been installed in other dc motors used in processing equipment undergoing test in argon atmospheres. The same material has been employed in universal motors used in vacuum cleaners and hand-drill units working in argon atmospheres; here the material has greatly increased the life of motors whose commutator peripheral speeds approach 5000 ft/min.

One such vacuum-cleaner motor ran for only about 15 min in a dry argon atmosphere on the brushes provided with the unit; the brushes had then worn completely down and caused short-circuiting of the commutator of the armature. An identical motor has now been in heavy use for about 1 year in a similar atmosphere after substitution of Stackpole grade-660 in the brushes. The new brushes still wear faster than in normal-humidity atmospheres, but at a reasonable rate that can be tolerated. Limited tests show promise for other grades of brushes in low-impurity atmospheres.

Reference:

Slawecki, M. A.; Bernstein, G. J.; Coleman, L. F.: Tests of Commutating Brushes for Use in DC Motors Operating in a Dry Argon Atmosphere. ANL-7262. Argonne National Laboratory.

Notes:

1. Designers or users of electric motors in dry, low-oxygen environments may be interested.

(continued overleaf)

2. Inquiries concerning this information may be directed to:

Office of Industrial Cooperation
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
Reference: B70-10045
Source: M. A. Slawecki, G. J. Bernstein, and L. F. Coleman
Chemical Engineering Division
(ARG-10243)

Patent status:

Inquiries concerning rights for commercial use of this innovation may be made to:

Mr. George H. Lee, Chief
Chicago Patent Group
U.S. Atomic Energy Commission
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439